

Pre-Algebra

Prerequisite: Mastery of Elementary Mathematics Levels 1-6

Course Description

The major emphases of the Pre-Algebra course are rational numbers, proportionality, measurement, data collection and analysis, probability, and beginning algebra concepts that serve as a transition into formal algebra and geometry. Students will develop a deep understanding of rational number concepts, become proficient in rational number computation, and learn to think flexibly about relationships among fractions, decimals, and percents. Concepts involving rational numbers will be developed through experience with problems involving a range of topics. Knowledge of proportionality concepts is developed through extensive applications of ratio and proportion, percent, similarity, scaling, and slope of linear equations. Students will learn to recognize and generate equivalent expressions as well as solve one- or two-step single-variable equations and inequalities. Students will investigate geometric relationships by drawing, measuring, visualizing, comparing, transforming, and classifying geometric objects. Important aspects of measurement will include selecting and using appropriate units and scales. Students will formulate questions; design studies; and collect, organize, and interpret data. Students will develop simple probabilities by using experimentation and analysis of possible outcomes.

While mathematical skills will be developed, teaching will focus on the understanding of concepts in depth, thus enabling students to apply mathematical skills and make meaningful connections to life's experiences. Students should see mathematics as an exciting, useful, and creative field of study.

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Standard 1: Students will acquire number sense and perform operations with rational numbers.

<p>Objective 1.1: Compute fluently and make reasonable estimates.</p> <ul style="list-style-type: none"> a. Compute using selected methods from among mental arithmetic, estimation, paper and pencil, and calculator. b. Add, subtract, multiply, and divide integers using the order of operations. c. Check the reasonableness of results using estimation. d. Justify the steps used in solving problems using correct notation. 	<p>Objective 1.2: Represent rational numbers in a variety of ways.</p> <ul style="list-style-type: none"> a. Recognize and create equivalent forms of a rational number. b. Find an approximate location of a rational number on a number line. c. Find a rational number between any two rational numbers. d. Choose appropriate and convenient forms of rational numbers for solving problems and representing solutions. e. Represent very large and very small numbers using scientific notation. 	<p>Objective 1.3: Identify relationships among rational numbers and operations involving these numbers.</p> <ul style="list-style-type: none"> a. Compare and order rational numbers. b. Identify the effects of arithmetic operations among fractions, decimals, percents, and integers; e.g., multiplying or dividing by a number larger or smaller than 1. c. Recognize and use the multiplicative property of zero. d. Recognize that division by zero is not defined. e. Recognize and use the inverse relationships of addition and subtraction, multiplication and division, and perfect square roots and squares.
<p>Objective 1.4: Solve problems involving rational numbers using addition, subtraction, multiplication, and division.</p> <ul style="list-style-type: none"> a. Recognize the absolute value of a rational number as the value of its distance from zero. b. Evaluate numerical and algebraic expressions, including those with absolute values such as: $-2 = 2$ and $- 2 = -2$. c. Compute with percents, including those greater than 100% and less than 1%. d. Solve problems using simple proportions. 		

Standard 2: Students will represent and analyze mathematical situations and properties using patterns, relations, functions, and algebraic symbols.

<p>Objective 2.1: Use patterns, relations, and functions to represent mathematical situations.</p> <ul style="list-style-type: none"> a. Represent a variety of relations and functions using tables, graphs, manipulatives, verbal rules, or algebraic rules. b. Describe simple patterns using a mathematical rule or algebraic expression. c. Create and extend simple numerical and visual patterns, including those that have a recursive nature (e.g., Fibonacci numbers, triangular and square numbers). 	<p>Objective 2.2: Represent, solve, and analyze mathematical situations and properties using algebraic symbols.</p> <ul style="list-style-type: none"> a. Evaluate algebraic expressions when given values for the variable(s). b. Identify the x- and y-intercepts of a linear relation from an equation, graph, or table. c. Determine the slope of a linear relation from a graph or set of ordered pairs, including graphs of horizontal and vertical lines. d. Simplify numerical and algebraic expressions using the Commutative and Associative Properties of Addition and Multiplication, and the Distributive Property of Multiplication over Addition and Subtraction. 	<p>Objective 2.3: Represent quantitative relationships using mathematical models and symbols.</p> <ul style="list-style-type: none"> a. Use a table, graph, or algebraic expression to represent the relationship between two variables. b. Graph ordered pairs of rational numbers on a rectangular coordinate system. c. Identify approximate rational coordinates when given the graph of a point on a rectangular coordinate system. d. Model real-world problems using various representations, such as graphs, tables, equations, manipulatives, and pictures. e. Identify information as pertinent or extraneous within the context of the original problem.
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	e. Solve one- and two-step single-variable equations and inequalities.	
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Standard 3: Students will recognize, describe, and identify geometric shapes, and solve problems using spatial and logical reasoning, applications of geometric principles, and modeling.		
<p>Objective 3.1: Analyze characteristics and properties of two- and three-dimensional shapes and develop mathematical arguments about geometric relationships.</p> <ul style="list-style-type: none"> a. Identify congruent and similar shapes. b. Find missing lengths of similar plane figures using proportions. c. Classify two- and three-dimensional objects according to the defining characteristics. d. Identify relationships among the angles, side lengths, perimeters, areas, and volumes of similar objects. 	<p>Objective 3.2: Specify locations and describe spatial relationships using coordinate geometry.</p> <ul style="list-style-type: none"> a. Create and interpret scale drawings. b. Represent and explain numerical and algebraic relationships using geometric models, e.g., rectangular models for multiplication. 	<p>Objective 3.3: Apply transformations and use symmetry to analyze mathematical situations.</p> <ul style="list-style-type: none"> a. Reflect a geometric shape across a line in a coordinate plane and identify the coordinates of the vertices, e.g., the preimage $\triangle ABC$ with vertex A at (1, 2) is reflected across the y-axis, then vertex A' of the reflected image of $\triangle A'B'C'$ is located at (-1, 2) b. Translate a geometric shape a given distance on a coordinate plane and identify the vertices of the translated figure. c. Rotate a geometric shape about the origin in a coordinate plane and identify the vertices of the rotated figure.
Standard 4: Students will understand and apply measurement tools, formulas, and techniques.		
<p>Objective 4.1: Understand measurable attributes of objects and the units, systems, and processes of measurement.</p> <ul style="list-style-type: none"> a. Estimate measurable quantities in both standard and metric units, e.g., a vase holds a little less than a quart or about a liter; a 10K run is about 6 miles. b. Convert from one unit of measure to an equivalent unit of measure in the same system using a given conversion factor, e.g., 60 miles/hour $\times 1 \text{ hour}/3600 \text{ sec} \times 5280 \text{ ft}/1 \text{ mile} = 88 \text{ ft/sec}$. c. Measure and compute angles, perimeters, areas, and volumes using the correct size and type of units. 	<p>Objective 4.2: Determine measurements using appropriate techniques, tools, and formulas.</p> <ul style="list-style-type: none"> a. Determine an approximate distance between two points using map scales. b. Solve problems involving scale factors using ratios and proportions. c. Solve problems involving rates and derived measures, e.g., miles per hour, liters per kiloliter, cubic feet. d. Measure inaccessible heights or distances using similar triangles. e. Calculate surface area and volume of right prisms and cylinders using appropriate units. f. Develop formulas for calculating the circumference of circles and the areas of triangles, parallelograms, and trapezoids. g. Calculate the circumference of circles and the areas of triangles, parallelograms, and trapezoids using formulas. 	

Standard 5: Students will draw conclusions using concepts of probability after collecting, organizing, and analyzing a data set.		
<p>Objective 5.1: Formulate and answer questions by collecting, organizing, and analyzing data.</p> <ul style="list-style-type: none"> a. Conduct a survey or experiment to collect data. b. Organize and display data using graphical representations such as line plots, bar graphs, stem-and-leaf plots, histograms, scatter plots, circle graphs, box plots (box-and-whisker plots), and pictographs. c. Make conjectures from a graphical representation. d. Calculate the mean, median, mode, and range for a data set. e. Choose the measure of central tendency that is most appropriate to analyze a particular set of data. f. Describe how an individual data point may affect the measures of central tendency. g. Interpret and describe the spread of a set of data, e.g., range, box plot (box-and-whisker plot). h. Make predictions and describe the limitations of the predictions when using data samples. i. Evaluate reported inferences or predictions based on a data set. 	<p>Objective 5.2: Apply basic concepts of probability.</p> <ul style="list-style-type: none"> a. Conduct experiments to approximate the probability of simple events. b. Recognize that results of an experiment more closely approximate the actual or theoretical probability of an event as the number of trials increases. c. Derive the probability of an event mathematically, e.g., building a table or tree diagram, creating an area model, making a list, or using the Fundamental Counting Principle. d. Represent the probability of an event as a fraction, percent, ratio, or decimal. e. Identify mutually exclusive events. f. Recognize that the sum of the probability of an event and the probability of its complement is equal to one. g. Determine whether a game or process is fair. 	